3. Starting cylinder for reduced write current (not required for any Seagate disc drive)

4. Write precompensation cylinders (see section on write precompensation)

5. Maximum correctable error burst (ECC) (use the default setting or 8 for most systems)

6. Step pulse range (see drive specification and select the closest controller option within the range)

Be sure to spare out any hard errors listed on the drive *Final Test* sheet (shipped with the drive) if the format program allows you to enter a bad track list. Note: some drives have the defect list fixed to the top cover.

The drive can be partitioned with the FDISK program provided on the DOS diskette. Consult the DOS manual.

The high-level format can be done with the FORMAT program also provided on the DOS diskette. If a logical partition on this drive is to be the boot disk for your computer, be sure to copy the necessary operating system files to that partition. Consult the DOS manual for specific instructions.

TROUBLESHOOTING CHECKLIST

- Check power connection J3
- Check cables (pin-1 connected to pin-1)
- Check Drive Select jumper and resistor termination pack
- Check power supply (+5 and +12 Volts)
- Check controller jumpers (see controller documentation)
- Verify drive parameters (see drive specifications)
- Contact your dealer (be sure to have the controller, drive and system documentation handy)

Universal Installation Handbook

NOT FOR RESALE

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TECHNICAL SUPPORT

For further support information, contact your dealer, distributor or system integrator.

WARRANTY INFORMATION

The terms of your warranty are determined by your dealer, distributor or systems integrator.

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920 Disc Drive, Scotts Valley, CA 95066-4544, USA

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MS-DOS is a registered trademark of Microsoft Corporation.

INTRODUCTION

This manual is organized to assist you in the installation of your Seagate disc drive. The process entails configuring, mounting and formatting your drive.

Before attempting any installation, please read through all applicable sections of this document. The sections of the manual are organized in the following sequence:

Section 1 Lists product information.
Section 2 Describes the configuration of an ST412 Interface drive.
Section 3 Describes the configuration of an SCSI Interface drive.
Section 4 Defines the physical drive installation procedure.
Section 5 Describes the formatting operations necessary to use your drive with PC-DOS/MS-DOS.

BEFORE YOU BEGIN

Verify that the system is switched off and disconnected from main power before any installation is attempted.

- Do not unpack a drive until you are ready to install it in the system.
- Always handle the drive by the frame or casting.
- Do not touch the board components or connectors without observing static-discharge precautions.
- Seagate disc drives do not require any preventative maintenance. The head/disc assembly is sealed and does not contain any user-serviceable components. Do not tamper with the sealed top cover. Doing so will void your warranty.
- When transporting or shipping a drive or system, please ensure that they are correctly packed in the original container and shipped via an air-ride carrier.

SECTION 1:
PRODUCT INFORMATION

This document supports the Seagate hard disc drives specified below.

ST412 INTERFACE DRIVES USING MFM ENCODING AT 5.0 MEGABITS/SEC.

Product Information	ST125	ST138	ST225	ST251	ST251-1
Formatted Capacity (Megabytes):	21	32	21	42	42
Read/Write Heads:	4	6	4	6	6
Data Cylinders:	615	615	615	820	820
Step Pulse Range (μsec.)	3-200	3-200	5-200	3-200	3-200
Access Time (msec.):	28	28	65	40	28
Write Precompensation (cyl.):	N/A	N/A	300-614	N/A	N/A
Reduced Write Current (cyl.):	N/A	N/A	N/A	N/A	N/A
Power (Watts):	10	10	14.8	11	12

Product Information	ST4038	ST4051	ST4053	ST4096
Formatted Capacity (Megabytes):	31	42	44	80
Read/Write Heads:	5	5	5	9
Data Cylinders:	733	977	1,024	1,024
Step Pulse Range (μsec.):	10-70	10-70	3-70	3-70
Access Time (msec.):	40	40	28	28
Write Precompensation (cyl.):	300-732	N/A	N/A	N/A
Reduced Write Current (cyl.):	N/A	N/A	N/A	N/A
Power (Watts):	25.5	25.5	23	25.5

ST412 INTERFACE DRIVES USING RUN LENGTH LIMITED (2,7) ENCODING AT 7.5 MEGABITS/SEC.

Product Information	ST138R	ST157R	ST238R	ST251R	ST277R	ST4144R
Formatted Capacity (Megabytes):	32	49	31	43	65	122
Read/Write Heads:	4	6	4	4	6	9
Data Cylinders:	615	615	615	820	820	1,024
Step Pulse Range (μsec.):	3-200	3-200	5-200	3-200	3-200	3-70
Access Time (msec.):	28	28	65	40	40	28
Write Precompensation (cyl.):	N/A	N/A	N/A	N/A	N/A	N/A
Reduced Write Current (cyl.):	N/A	N/A	N/A	N/A	N/A	N/A
Power (Watts):	10	10	14.8	11	11	25.5

SCSI INTERFACE DRIVES

Product Information	ST138N	ST157N	ST225N	ST251N	ST277N
Formatted Capacity (Megabytes):	32	48	21	43	64
Sectors per Drive:	63,139	95,015	41,720	84,254	126,790
Access Time (msec.):	28	28	65	40	40
Power (Watts with termination):	12	12	16.8	13	13

SECTION 2:
ST412 INTERFACE DRIVE CONFIGURATION

MFM CONTROLLER SELECTION

The hard disc controller you use will affect the performance of the drive. To achieve full performance with an MFM drive, you must use an MFM controller which operates the ST412/MFM interface at 5.0 megabits/sec.

Operation of an MFM drive at data rates other than 5.0 megabits/sec. or operation of an MFM drive with an RLL controller is not approved by Seagate and will void your warranty.

RLL CONTROLLER SELECTION

To achieve full performance with a Run Length Limited (RLL) drive you must use an RLL (2,7) controller which operates the ST412/RLL interface at 7.5 megabits/sec.

Only Seagate drives with an *R* appended to the product number are designed and certified for use with a Run Length Limited (RLL 2,7) controller. Note: early ST238, RLL drives did not have the *R* suffix.

Operation of an RLL drive at data rates other than 7.5 megabits/sec. or operation of an RLL drive with an MFM controller is not approved by Seagate and will void your warranty.

WRITE PRECOMPENSATION

For optimum performance, provide write precompensation on only the ST412/MFM drives listed below. **Drives not listed do not require precompensation.**

ST213, ST225:	Cyl. 300 to 614
ST4038:	Cyl. 300 to 732

Some controllers provide a default precompensation setting from cyl. 256. The ST213/225/4038 will perform adequately at this default.

DRIVE SELECT JUMPERS

A jumper must be installed to select the desired "Drive Select" number. Refer to Figures 1, 2 and 3 for the locations of the Drive Select jumpers.

IBM PC XT/AT Installations:

Examine the cable that connects the controller to the J1 connector on the drive. In many cases the cable will have connectors at both ends and a third connector approximately 6 inches from one end. The end with two connectors is connected to the drive. Check to see if the ribbon cable is split with a group of wires twisted between the two connectors at the drive end.

- **"C" Drive Configuration:**
  - If you have a twisted cable (as defined above), configure the drive as Drive Select 2.
  - If you have an untwisted cable, configure the drive as Drive Select 1.
- **"D" Drive Configuration:**
  - If you are connecting a second hard disc drive, configure the drive as Drive Select 2.
- **Attach the Cables:**

  Note that at all connections, pin-1 on the controller corresponds to pin-1 on the drive. Some cables have a contrasting-color stripe on one edge to indicate pin-1.

  Connect the J1 connector on the "C" drive to the connector at the end of the cable. Connect the J1 connector on the "D" drive to the middle connector on your cable.

RESISTOR TERMINATION PACKS

If you are installing a single drive, the resistor pack must remain installed. If you are installing multiple hard disc drives, remove the resistor termination pack from all drives not connected to the last connector on a J1 cable.

When reinstalling a resistor pack, note that pin-1 on the pack is denoted by a dot or numeral one. A square pad on the disc drive board indicates pin-1 at the socket. Refer to Figures 1, 2 and 3.

READ/WRITE HEAD AUTO-PARK

All Seagate disc drives, with the exception of the ST213, ST225, ST225N and ST238R products, have an automatic read/write head parking function at power-off. This feature does not require operator intervention.

Some versions of DOS support a parking command for the products listed above. Refer to the system documentation. Third-party software is also available for this task. Contact your dealer, distributor or systems integrator.

FIGURE 1: MFM/RLL, 3.5 Inch Interface Connectors

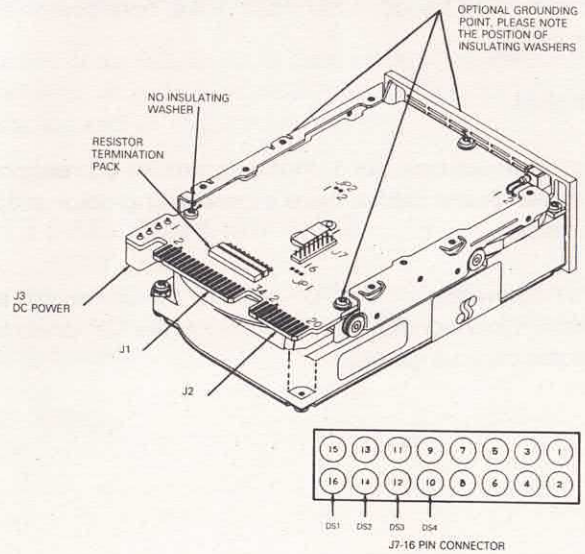

OPTIONAL GROUNDING POINT. PLEASE NOTE THE POSITION OF INSULATING WASHERS
NO INSULATING WASHER
RESISTOR TERMINATION PACK
J3 DC POWER
J1
J2
15 13 11 9 7 5 3 1
16 14 12 10 8 6 4 2
DS1 DS2 DS3 DS4
J7-16 PIN CONNECTOR

FIGURE 2: MFM/RLL, Half-Height Interface Connectors

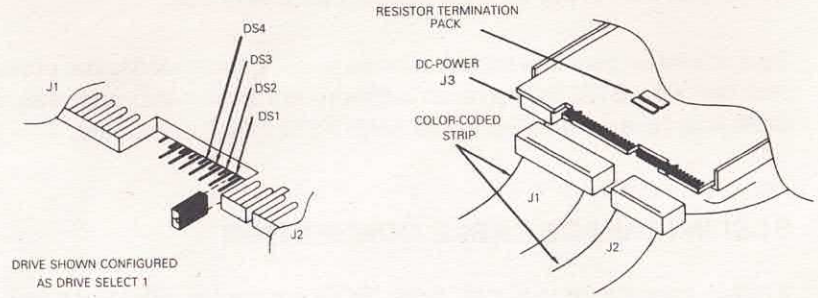
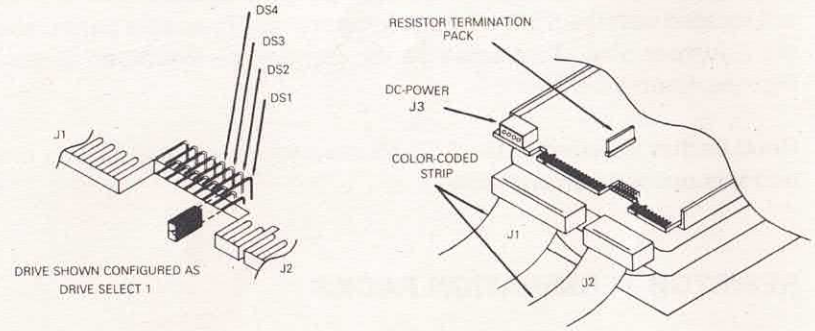


FIGURE 3: MFM/RLL, Full-Height Interface Connectors



SECTION 3:
SCSI INTERFACE DRIVE CONFIGURATION

Seagate intelligent drives, designated by an *N* appended to the product number, i.e., ST251N, have an onboard controller that supports the SCSI interface as defined in the ANSI X3T9.2/82-2 document.

SCSI INTERFACE CABLE CONNECTION

System connection is via a 50-pin, SCSI connector. Pin-1 is noted in Figures 4 and 5 below. Strain relief is recommended at the cable.

SCSI ADDRESS SELECTION

The SCSI address jumpers are located adjacent to the 50-pin, SCSI interface connector. Refer to Figures 4 and 5 below.

OPTIONAL PARITY BIT ENABLE

Some system buses require parity bit checking. Consult the system documentation for the specific requirements.

Most drives have an additional two jumper pins to enable parity. They are located with the SCSI address jumper pins. To enable parity, short the *P-jumper* pins. To disable parity, remove the *P-jumper*. Refer to Figures 4 and 5 below.

Note: Earlier versions of the ST225N may not have these jumper pins, and this option is unavailable.

RESISTOR TERMINATION PACKS

If you are installing a single drive, the resistor termination packs must remain installed. When installing resistor packs, note that pin-1 is designated by a dot or numeral one on the pack. A square pad on the board indicates pin-1 at the resistor pack socket.

If you are installing two or more drives, **remove the resistor packs on all but the last drive in the chain.** Refer to Figures 4 and 5 below.

FIGURE 4: 3.5" SCSI Interface Connectors

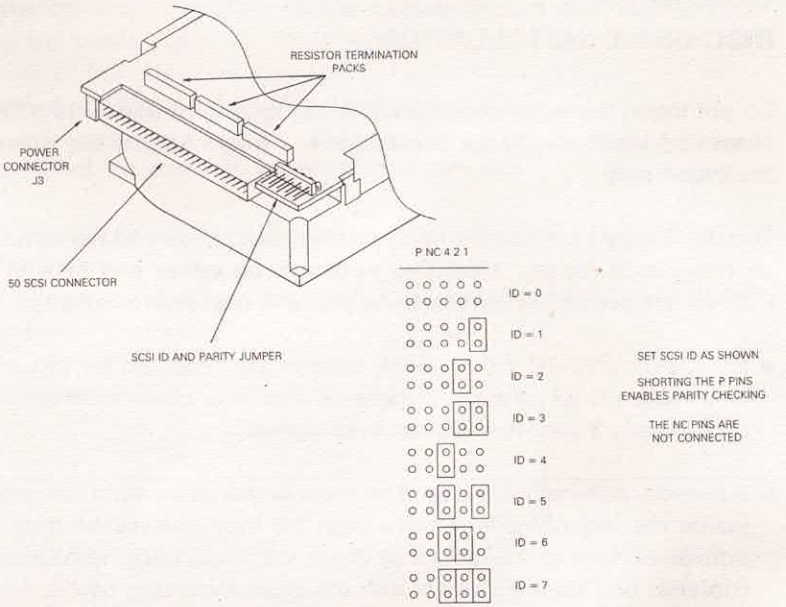
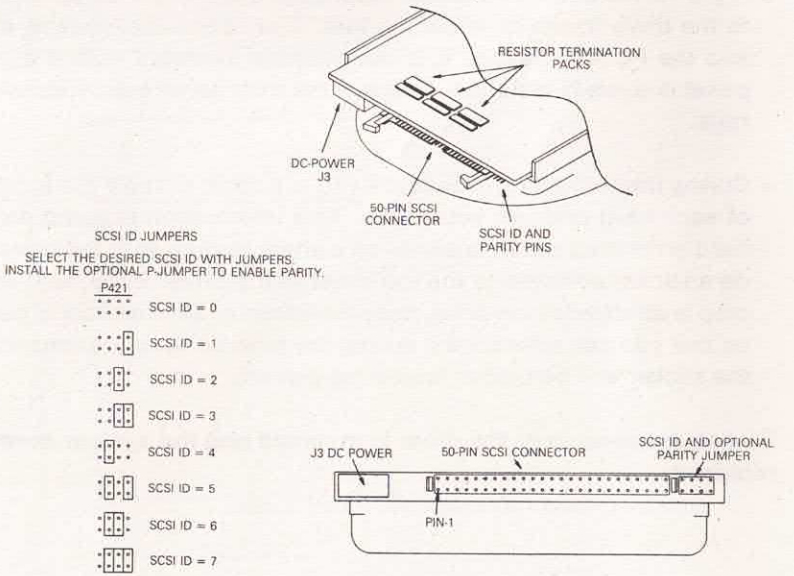


FIGURE 5: 5.25" SCSI Interface Connectors



SECTION 4:
DISC DRIVE INSTALLATION

Do not touch the edge-connectors or any board components without observing static-discharge precautions. Always handle the drive by the frame only.

The drive may be mounted horizontally (main circuit board down) or on either side (edge). **Mounting vertically on either end or with the PCB up are prohibited orientations and will void your warranty.**

- Four, 6-32 UNC-2B x 0.31 (5/16) screws are required for mounting in an IBM PC XT chassis. Tighten the screws down evenly to approximately 8 inch-lbs. **Do not over-tighten.**

- 5.25-inch, half-height drives: The mounting screws must not extend inside the mounting feet more than 1/8 inch, measured from the outside surface of the foot. If all the system mounting holes are not coplanar and do not line up with the drive mounting holes, **do not force the drive to conform.**

- A PC AT installation requires mounting rails, which fasten directly to the drive frame or mounting feet. They allow the drive to slide into the PC AT chassis. It is not possible to install rails if a front panel is already installed. Remove the front panel before installing rails.

- During the formatting procedure you will need to know the location of each hard error on your drive. This information is found on the hard error map which is either on a sheet packed with the drive, or on a sticker attached to the top cover of the drive. If the hard error map is attached to the drive, copy the information to a sheet of paper so that you can reference it during the formatting operations when the sticker will be hidden inside the system.

Do not power-up until the drive is mounted and the system cover is replaced.

1. Verify that all connections between the drive and the controller are correctly installed. Some cables have a contrasting-color stripe indicating pin-1. The even-numbered pins are on the same side of the board as the resistor termination pack(s) Pin 2 is labeled on the circuit board edge-connectors.

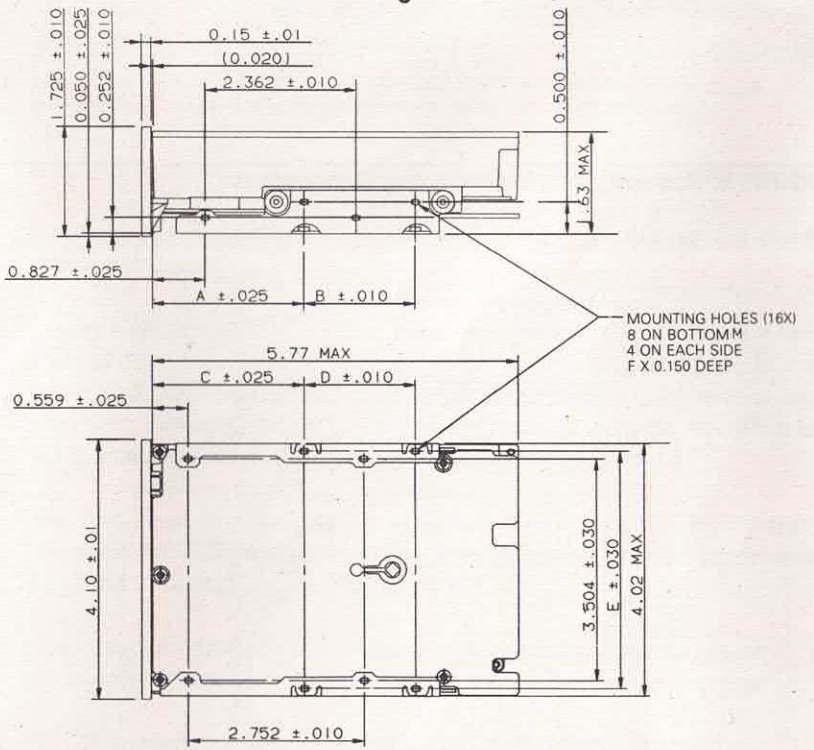
2. Connect the drive DC power connector (J3).

3. Verify correct cabling, jumper and resistor-pack configuration.

4. You are now ready to secure the drive into position and replace the system cover.

5. Continue to the primary format operations.

FIGURE 6: 3.5 Inch Drive Mounting Dimensions



TABULATION						
THREAD TYPE	A	B	C	D	E	F
ENGLISH	2.375	1.750	2.375	1.750	3.750	6-32 UNC-2B
METRIC	2.433	1.752	2.433	1.752	3.752	M4 X 0.7-6H

NOTES:
1. ALL DIMENSIONS, INCLUDING TABULATION, ARE IN INCHES.

FIGURE 7: Half-Height Drive Mounting Dimensions

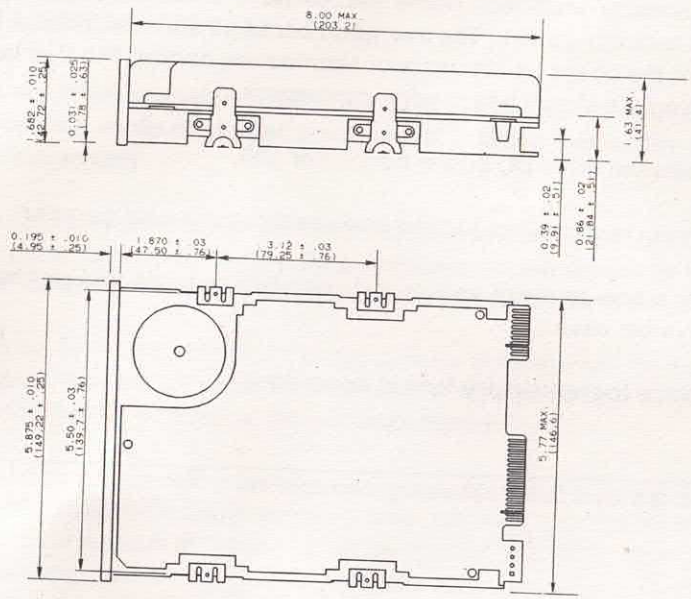
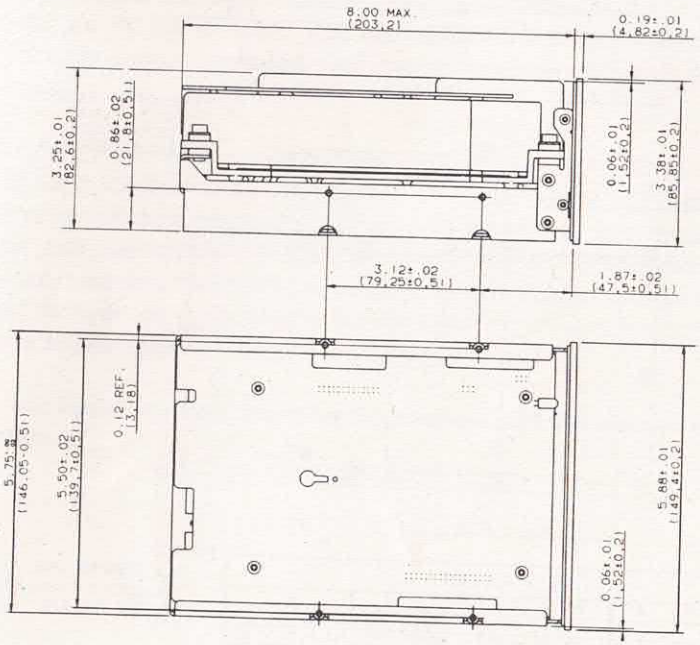


FIGURE 8: Full-Height Drive Mounting Dimensions



SECTION 5:
DRIVE FORMATTING

The MFM/RLL drive format routine is detailed below.

If you are installing a Seagate disc drive with a Seagate controller/Host Adaptor, refer to the installation guide that was shipped with the controller/Host Adaptor for formatting instructions.

ST412 INTERFACE MFM AND RLL DRIVE FORMATTING

The formatting operation has three different stages, which must be completed before the drive may be used:

- A low-level (or primary) format to establish communications between the controller and the drive.
- Partitioning the drive into one or more logical drives.
- A high-level format to install the operating system on the drive.

Caution: you must use the same version of DOS throughout the formatting process.

Drives with greater than 32 formatted megabytes require device driver software for formatting. Seagate ships partitioning software to overcome the DOS limitation of 32 megabytes. The software is shipped only with drives that format to greater than 32 megabytes. This software executes all three steps in the formatting process.

The low-level format may be completed using the DEBUG program found on the DOS system or supplemental diskette with the *Advanced Diagnostics* program, available from IBM.

You may be asked by the DEBUG or diagnostic program to enter the following parameters (see your controller or software manual):

1. Number of cylinders (see Section 1: Product Information)
2. Number of heads